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A Weekly Summary of Current Science

EDITED BY WATSON DAVIS

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ARTIFICIAL FOOD

By Dr. Edwin E. Slosson

The other day Secretary Hoover, in referring to the new German process for making methanol and formaldehyde directly and cheaply from coal and water, suggested the possibility that the chemist may some day be able to make synthetic food.

The first and fundamental question is whether food can be made from earth, air and water. Anybody can answer that question as well as a chemist, for all our food is now made from earth, air and water.

The real questions are: Will man ever be able to manufacture his own food? Must he always be dependent upon the plants for his provender?

These are not so easily answered because food is of various sorts and some are easier to produce than others. As everybody knows nowadays there are five classes of compounds essential to every well balanced diet. There are: first, salts; second, fats; third, carbohydrates; fourth, proteins; fifth, vitamins. I put them in this order because this is the order in which the chemist is conquering them.

The first, the mineral matter, is already conquered, for the chemist can make any kind of salts he wants, and he now knows what kinds he wants.

The second food constituent, the fats and oils, can also be struck off the list for the chemist could make any of them out of coal and water if he had to, though he would hate to have to for it is a tedious and expensive process and he would starve before he got enough to butter his bread or dress his salad. He can not only imitate nature in making any of the fats found in plants and animals, but he can make new ones that nature never thought of. I have on my desk a quarter pound of such a synthetic fat, glyceryl margarate, the chemist calls it, that is altogether an artificial compound, yet is as nutritious as tallow or lard.

The third class, the carbohydrates, comprise a variety of starches and sugars and similar substances. They are very complicated compounds of carbon, hydrogen and oxygen and their structure has only recently been unraveled. The simplest possible compound of these three elements is that containing one atom of carbon, one of oxygen and two of hydrogen. This is formaldehyde, the irritating gas used as a disinfectant under the name of formalin. Now if you multiply the formula of formaldehyde by six you get the simplest of the sugars, glucose. This multiplication of the molecule is easy to do on paper, but if you try to do it in the laboratory you will find it tremendously difficult.

Hundreds of chemists have worked at the problem and only a few have succeeded and these to only a limited extent. Last summer at the Toronto meeting of the British Association for the Advancement of Science, Prof. E. C. C. Baly of the University of Liverpool exhibited a bottle of syrup which he had made by exposing a solution of formaldehyde in water to the ultra-violet rays from a quartz mercury lamp for weeks. This had been analyzed by Principal Irvine of St. Andrew's Univeristy, Scotland, and found to contain some ten per cent. of glucose and sugars of similar sort. Principal Irvine at the same meeting announced the synthesis of a starch, which is a still more complicated compound, for starch breaks down into glucose. So it is evident that there is no insuperable barrier to the artificial manufacture of these two forms of food from which we derive most of our muscular energy. But to get even the small amount of sugar that Professor Baly made required enormous expenditure of electrical energy, and it was not fit to eat at that.

To produce the fourth class of food ingredients, the proteins, is much more difficult than the preceding because their structure is more complex and varied, and a variety of them is essential in any diet. One kind of sugar can replace another and all the fats are likewise interchangeable. We can even get along without sugar if we have fat, and vice versa. But we not only have to have some protein in our food but we have to have several particular kinds. A protein molecule may embrace a sugar molecule and will also contain certain compounds containing nitrogen which are called the "amino acids" because they are related to ammonia. There are some eighteen amino acids found in food, but they may not all be essential. Perhaps we could get along on a dozen or less. The constitution of the amino acids is known and they might be made artificially. It has been found on feeding experiments with rats that they will live on a diet without protein if they are fed with the proper kinds of amino acids. That is, they can construct the proteins of their body out of the building blocks of amino acids. So we may not need to go so far as the complete protein to get synthetic food.

The fifth food factor, the vitamins, is still far beyond our reach. We know there are several substances that are essential for any dietary in minute amounts, but we do not yet know how many there are, nor what theyare. They are not even named, but are provisionally labelled A,B,C,D,E, and nobody can tell how much farther down the alphabet they will run. None of the five or more has yet been identified. They are all mavericks so far but we may expect them to be caught and branded before many years. The latest triumph in this field is the discovery that it is possible to form or at least to activate one of the vitamins, in food that does not contain it, by the action of ultra-violet light. This gives promise that the chemist may be able to make them whenever he findsout just what they are.

This then is the situation. Three of the five food factors could theoretically be made in the laboratory, though it may be some time before we make enough of the third to feed a rat. The fourth seems possible and the fifth looks hopeful.

But from test-tube experiment to laboratory production is a long and perhaps unattainable step. Even if we learn how to make the various constituents of our daily diet we shall likely find that in general it will not pay us to do it for the plants can still make them cheaper than we can.

So to the first question, "Will man ever be able to manufacture his own food?" I would answer "yes". And to the second question, "Must he always be dependent upon the plants for his provender? ", I would also answer "yes".

CENTURY-OLD FRENCH ENGINE EXPLODED SOLID FUELS

French scientific circles have been deeply stirred by revelations just made concerning the possibility of using solid fuel in explosive form for the propulsion of engines and motors. The announcement is based on research into the discoveries of Nicephore Niepce, recorded in the annals of the French Academy of Sciences of almost a century and a quarter ago- a hundred years before the invention of the Diesel internal combustion engine.

The matter was brought before the Academy by M. Rateau, leading member and scientist of recognized standing. For clear presentation of the subject the savant exhibited a model of an engine devised by Niepce. This engine was described in the proceedings of a meeting of the Academy held December 15,1806. The Rateau model was a reconstruction produced by M. Clerget, a well known aeronautical engineer of Paris.

In the Niepce engine internal combustion was produced by means of solid fuel, instead of oil. The fuel was in powdered form, and it was shown that the engine could function with either lycopodium powder or a mixture of powdered coal and resin. The energy was furnished by a series of interrupted explosions. The records show that Neipce actually applied his motor to the propulsion of a boat against the current on the river Saone.

Rateau sets forth the belief that lycopoduim is the ideal combustible. It is composed of spores which are exceedingly small, of regular dimensions, and burning rapidly without leaving ash. He expresses the belief that the future holds promise of developing the use of solid fuel in the cylinder motor.

Niepce was one of the inventors of photography, with Daguerre. He perfected the system of heliography now used by armies throughout the world.

BLOOD OF HUMAN RACES SHOWS STRANGE HEREDITY

Blood tests which may show remarkable similarities in heredity between races hitherto considered unrelated were recently reported by Dr. Reuben Ottenberg of New York City to the American Association of Immunologists.

Japanese were classed with the South Chinese and Hungarians. Manchurians were placed with the Hindus of India. Senegalese negroes, Madagascans and South Asiatics were grouped together. American Indians and aboriginal Australians were put in the same class; while Spanish Jews showed the same blood characteristics as Arabs, and German Jews were similar to Germans.

These classifications were based on similarities in the proportion of individuals of the four heredity blood types found among large numbers of people from these different regions. Every human being, Dr. Ottenberg explained, has blood of one of four types depending upon the presence or absence of two substances which have been found to be hereditary. One type has substance A. A second type has substance B. A third type has neither A nor B, while a fourth and relatively rare type has both A and B.

The proportion of individuals of the different types, however, varies in different geographical regions, tests made for transfusion operations show. Grouping those regions which showed similar proportions of individuals of the three main types Dr. Ottenberg formed six classes which he called: European, Intermediate, Hunan, Indo-Manchurian, African-South Asiatic, and Pacific-American.

Whether these groups represent biochemical races or show similarities which have arisen in different regions entirely independently, Dr. Ottenberg declared it was too early yet to state. More data from more parts of the earth are needed to complete the blood map of the world or permit any sound conclusions to be reached as to just what these highly interesting findings indicate.

RICKETS STOPPED BY LIGHT-TREATED MILK

Light treated milk instead of cod-liver oil is the "good medicine" for children announced by Dr. Benjamin Kramer before the American Pediatric Society meeting.

Rickets, a disease of children's bones due to lack of lime and phosphorus, has long been treated with cod-liver oil, though nobody knew just why. Recently an anti-rachitic vitamin has been shown to exist in the nasty stuff. At the same time researcheswere going on which have shown that the invisible short-length or ultra-violet light rays have the power to prevent rickets, either by exposing children to them directly, or by exposing certain foods to their action.

Dr. Kramer made a critical test of this action on milk. Eight children who were severely afflicted with rickets were given daily rations of milk which had been exposed for two hours to the action of ultra-violet light from a quartz mercury vapor lamp. X-ray pictures, which Dr. Kramer exhibited, showed that the bones of these children began to heal by the end of the third week of this treatment, and that the cure was well advanced by the end of the fourth week.

"The changes in the bones and blood were similar to those which followed the administration of cod-liver oil or the exposure of the child itself to radiations from the quartz mercury vapor lamp," said Dr. Kramer.

HEAT-OPERATED ICEBOX NEW SWEDISH INVENTION

An artificial ice box that operates like a coffee percolator and generates cold from heat has been invented by two young Swedish engineers of the Stockholm Institute of Technology, Carl Munters and Baltzar von Platen. When heated at one point, either by gas, electricity, or kerosene, it cools the usual kind of food chest and for ordinary household purposes needs to be run only a few hours a day. When operated with gas at the Stockholm prices it produces the equivalent effect of eight pounds of ice at the cost of one cent, and in view of the mild winter and the consequent shortage of natural ice facing the country, the new invention comes most opportunely.

The construction of the new ice chest is extremely simple. It has no movable, mechanical parts, no pistons, fans, pumps, ventilators, or any gears to get out of order. The action is initiated by heat which sets an ammonia solution in motion in a small boiler. The ammonia then passes through condensation tubes and while trickling down a generator mixes with hydrogen and by thus evaporating absorbs enough heat to cool the food in the refrigerator. In a third cylinder, called the "absorber", the ammonia is washed free from hydrogen and

then percolates down through a set of tubes into the boiler again, where the heat once more sets it in motion. While this action is kept up the refrigeration process continues. To effect the condensation running water has so far been used, but an air cooling system is being devised by the inventors.

For the launching of the new idea the Royal Board of Trade has granted a loan of 300,000 kroner and manufacturing has already started on a commercial scale.

RADIO AIDS FIGHT AGAINST EPIDEMICS OF FAR EAST

Radio has been impressed into servicein the world battle against disease by the League of Nations. Each week the great wireless station at Saigon, French Indo-China, broadcasts into the ether reports of the state of health of the Far East, the plague area of the world. Heretofore these reports moved more slowly by mail or in a more limited area by cable. The epidemiological reports are compiled at the League base of operations at Singapore and include the latest figures on smallpox, plague and other dangers to man. In many cases they will allow quarentine regulation to be set up in sufficient time to protect other countries against invasions of disease imported from the infected lands.

DOGS, OPTIC NERVE SEVERED, PARTIALLY RECOVER SIGHT

Evidence that a severed optic nerve can reunite and at least partially recover its function has been obtained here by Dr. Theodore Koppanyi, working in the laboratory of Prof. Anton Carlson at the University of Chicago. Dr. Koppanyi created a sensation last year when he succeeded in transplanting the eyes of rats. He has since moved up the scale of life and is now working on dogs.

Prof. Carlson informed a representative of Science Service that Dr. Koppanyi has been able to get a re-growth of the severed optic nerve when the eye it supplied was left in place. Attempted complete transplantations have not so far been successful, due to the difficulty of preventing infection, and the practical impossibility of keeping the transplanted member still. But the eyes whose optic nerves had been severed and reunited showed a definite pupillary reflex, one of the signs of a properly functioning connection. Moreover, these dogs behaved as though they were able to distinguish objects dimly with their operated eyes.

Another result obtained by Dr. Koppanyi is the repair of injured cornea, or white of the eye, with a transparent membrane taken from the abdomen. This, it is stated, is of great possible significance to surgery, since at present a severe injury to the eyeball usually means the loss of the eye.

Prof. Carlson and Dr. Koppanyi do not wish their present results to be interpreted as meaning that human eye transplants are to be a commonplace operation in a year or two. The work is still in a very early stage, they say, and it will require many more experiments on animals before a human operation, even in a desperate case, can be attempted.

CRIMINALS NOT FEEBLE-MINDED, MENTAL TESTS DISCLOSE

That criminals not only hold their own with the rest of the world in ability topass mental tests, but even stand a little in advance of it, is made known by an extensive investigation carried on by Dr. Carl Murchison, professor of psychology in Clark Univeristy.

Disregarding geographical distribution and basing his conclusions on some thousand cases, Dr. Murchison found that out of every hundred white, native, male criminals, 29 had an intelligence level of C, as measured by the Alpha Army test. This is practically the same proportion of C men found in the white draft, which may be taken as fairly indicative of the white adult male population of the United States. But of the remaining 71 criminals in each hundred, 39 had an intelligence level above C and 32 below C, while for the army out of every hundred only 33 were above C while 38 were below. Unless other conditions account for the differences, the criminals would seem to be slightly better endowed with gray matter than the army men were. Comparison of white criminals for Illinois, Indiana, New Jersey, andMaryland separately with the white draft from each state shows similar results.

Dr. Murchison obtained his data in part while chief psychological examiner at Camp Sherman, Ohio. Later he personally tested prisoners in certain prisons in Ohio, Illinois, Indiana and Maryland and also obtained data on prisoners in New Jersey.

Dr. Murchison also discovered that criminals confined within their native states have a lower mental ranking than those who have migrated to other states. He sees in this fact a selective process which keeps men with more alert minds on the move.

He did not find it possible to relate all types of crime to mental levels, but found that crimes of fraud are the especial hobby of superior intellects and crimes against sex of the inferior.

ITALIAN EARTHQUAKE PROPHET RELIES ON LAWS OF CHANCE

Earthquake prediction issued by an Italian scientist, Professor Bendandi, which have been published in America and which seem to have coincided with some recent earth shocks, have been severely criticized as unscientific and unfounded by Prof. G. Agamemnone, declared to be the ablest Italian seismologist of the present time.

According to a published statement that has been received from Rome by America scientists here, Professor Agamemnone declared:

"Bendandi evidently works on the laws of chance and predicts enough earthquakes to have a fair average of success. He asks 24 hours leeway in his predictions, and with this and the number that actually occur he could scarcely fail to be right sometimes. His attempt appears to be a sensational effort to do something which many eminent scientists have worked on but in which they has as yet had little success."

Professor Agamemnone says, however, that there is no kind of phenomena which lends themselves so readily to prediction as seismic phenomena. Over a

period of thirty years there have been an average of thirty- eight earth tremors a month in Italy and therefore a prediction is nearly certain to be fulfilled. The Philippines have practically the same frequency while Japan has 1500 shocks a year or 4 a day.

It is understood that the Italian Government decided that Bendandi's predictions for Italy were, regardless of their correctness, hurting the tourist trade and he was suppressed so far as Italy is concerned. Bendandi then transferred his activity and bestowed his predictions on other parts of the world.

AMERICAN FRESH-WATER RESOURCES SUBJECT OF SCIENTIFIC SURVEY

The little-used and little-known food resources of American rivers, lakes and ponds, are the subject of a research program projected by the division of biology and agriculture of the National Research Council. Prof. Maynard M. Metcalf, chairman of the division, is at present engaged in organizing a committee for the purpose of making a preliminary canvass of the situation and determining what program of action should be adopted.

"This is not merely a question of fisheries," said Dr. Metcalf. "To obtain the information needed for a real knowledge of the food possibilities of our fresh waters we need to have the points of view of many types of scientists. We need the point of view of the aquatic botanist, for the foundation of all the life in the waters lies in the green plants, most of them of microscopic size, that capture chemical elements and sunlight and manufacture the basic foodstuffs. We need the point of view of the aquatic zoologist, for these microscopic plants are eaten by microscopic animals, which in their turn are victims of water insects and small crustacea. These in turn are food for smaller fish, and the little fish are eaten by the big ones; and here we need the fish expert. We need the chemist's point of view, for all life in the waters is very sensitive to chemical changes. And finally, we need the help of the pathologist and bacteriologist, for water life, like all other life, is subject to diseases."

Dr. Metcalf said that his interest in the possibilities of exploitation of the waters, or "aquiculture", was first roused during a sojourn in a Bavarian city, where a population of about 80,000 and been abundantly supplied with fish out of one small river for hundreds of years. He thinks it possible that a considerable part of the answer to the question of food needs for the increasing population of America can be met in the neglected waters of our rivers, lakes, marshes and small ponds. The small pond on the farm is an object of especial interest. Prof. Metcalf stated that he would like to see every farmer in a position to raise his own fish.

POWERFUL HOOKWORM CURE FOUND BY U. S. SCIENTISTS

A new and highly efficient cure for hookworm was described before the meeting of the American Society for Tropical Medicine by Drs. Maurice C. Hall and J. F. Shillinger, of the U. S. Department of Agriculture. Dr. Hall is the discoverer of the use as a hookworm remedy of the common cleaning fluid carbon tetrachloride, which has largely replaced the chenopoduim oil formerly used. His new discovery is known as tetrachlorethylene. It is somewhat more complex in its chemical structure than carbon tetrachloride, but basically it is somewhat similar to it.

The advantages which Dr. Hall claims for the new remedy, as compared with carbon tetrachloride, are equaleffectiveness and greater safety. One spoonful of the older remedy, followed by Epsom salts, commonly suffices to clear up an ordinary case of nookworm. The new treatment requires a dose only two-thirds as large. The factor of safety, Dr. Hall says, seems to be very large. Heavy overdoses may cause illness, but in his experiments with dogs he has given as much as one hundred times the curative dose before the animal was killed. In regular medical and veterinary practice, of course, no such overdose would ever be given.

ALASKAN FUR SEAL HERD EN ROUTE FOR ISLANDS

A billion dollar fur seal herd swimming from the balmy tropical seas to the bleak Arctic waters, is just about due at the Pribilof Islands, in the Bering sea. This migration of the fur seals came slowly up the north Pacific coast under a veritable armed escort of Uncle Sam's coast guard cutters. First of these guardian angels patrolling the fur seal lines was the U. S. S. Snohomish, which accompanied the host to Dixon Entrance. At that opening the cutters Algonquin and Haida chaperoned the male seals or advance guard to the Misty Isles. Following closely behind the bulls were some six or seven hundred thousand cows and younger animals.

From the great cavalcade of furred mammals sometime in June and July the government will select and slaughter between 25,000 and 35,000 whose skins after being shipped to dressers and dyers in St. Louis will bring more revenue than Alaska's gold crop at its height.

Only one more year remains of the eleven year treaty signed by Canada, Japan Russia, and the United States whereby the protection of the rookeries was handed over to the American government. In 1927, unless the treaty be renewed, anyone may confiscate the fur seals. However, every one connected with the industry little doubts but that another similar and perhaps more stringent protective act will be promulgated.

BLACK TANKS WASTEFUL, STORAGE TESTS SHOW

Black cows are hotter than white cows. At least it seems so if one places his hand upon the black or the white areas of a spotted cow which is standing in the sun. Recent tests have proved that the same thing is true of black-painted and white-painted oil tanks; and important use of this difference is being made in the petroleum business.

This work has been done by Oklahoma and Federal Bureau of Mines investigators who have reported the effect of tank colors on the evaporation loss of crude oil stored in such tanks. It was found that a tank covered with aluminum paint, white paint, or tin plate rose in temperature when subjected to a given intensity of light only 19 to 22 degrees; but if the tank was painted dark blue or dark green, the increase in temperature was 35 to 40 degrees; and if the tank was painted black it increased in temperature by 54 degrees.

Moreover, the loss of the oils which filled these tanks was very different. During a short period the black-painted tanks lost 9 per cent of their naphtha content, whereas the white-painted tanks under the same conditions lost only 4 per cent. Some tests were made on big tanks containing 55,000 barrels of crude

oil each. In this case the evaporation loss was more than 50 per cent. greater in the black tank than in the one painted with aluminum paint.

The result of these tests indicate the importance of light colored paint for storage tanks containing oils or other compounds which may be lost by evaporation at slightly elevated temperatures. This is sufficiently important that some of the petroleum companies have already adopted the custom of giving their gasoline storage tanks a fresh coat of light colored paint each year. The saving from evaporation more than pays the cost of the frequent painting. And incidentally the regular painting keeps the tanks in good order, reducing corrosion and leakage.

HEAVY MOTOR TRAFFIC DAMAGES WATER MAINS

In addition to its damage to pavements, the motor truck has been tried and found guilty on the charge of working havoc with the water mains of American cities. The indictment and verdict were handed down by the engineers of the municipal water department of Baltimore.

In common with other cities throughout the United States, Baltimore has had an increasing amount of trouble with broken mains and unexpected floods. Careful survey of the situation has placed the blame, to a large extent, on the passage of heavily laden motor trucks. These cumbersome vehicles cause vibrations which penetrate to the pipes and disrupt the joints or break open the pipes themselves. Heavy street cars, passing locomotives, and disturbance caused by the building of sewers, gas mains and electric conduits receive their share of the responsibility, but the chief burden of the verdict is against the motor truck.

The increased number of water-main failures has kept pace with the expansion of truck traffic. Water engineer Bernard Siems, of Baltimore, has studied the subject through the medium of careful survey of the situation in this city and other centers of population. He finds that the trouble is general. The North has some advantage over the South because of the greater depth at which the pipes are buried, for protection against freezing. This factor, however, is by no means equivalent to insurance against breakage. The vibrations caused by trucks penetrate to considerable depth. This is confirmed by Baltimore's series of vibration tests, effected by the use of highly sensitive instruments.

In addition to calling for the control of truck loadings, Baltimore is increasing the depth of burial and is giving more careful attention to the work of tamping and packing new pipe construction.

CHILDREN'S HEALTH BETTER INSURANCE RECORDS SHOW

The four mostdangerous diseases of childhood are being more successfully resisted this year than ever before, figures just completed by Louis I. Dublin, statistician of the Metropolitan Life Insurance Company, show. As compared with the first months of 1924, the diphtheria deathrate in the industrial policyholder group has fallen 31 per cent., and deaths from measles totalled less than one-quarter of the record for the same period. Scarlet fever and whooping cough registered substantial declines.

Among adults, though the mortality figures show a general encouraging decline, there has been an increase in the deathrate due to diabetes, which had fallen off noticeably a few months ago. Deaths from alcoholism and from cirrhosis of the liver, an associated malady, are slightly on the increase.

TURKS AND SOVIETS WILL DISCARD ARABIC LETTERS

The Arabic alphabet, in which so much of the foundations of modern science was recorded, is disappearing rapidly.

Following orders from Moscow, it has been banished from the schools of the Soviet Republic of Azerbaijan and the readers and dictionaries are being reprinted in Latin characters.

The movement is fast spreading into Turkey, according to dispatches from Constantinople, and has the encouragement of the Angora government which believes that the rather complicated lettering system prevents rapid progress.

SMALLPOX EPIDEMIC THREATENS ENGLAND

Britain is having her difficulties with smallpox no less than the United States. Almost non-existent in these Islandsbefore the war, smallpox has been threatening to come back since, and has now reached a condition where public health authorities are beginning to be genuinely concerned. There was a violent local epidemic in Gloucester in the summer of 1923. This was brought under control, but the number of cases in the country did not fall to the earlier level, and during 1924 there was a steady increase. At the beginning of the present year, there was a sudden jump, so that the number of cases at the present time is more than double the 1924 average.

Public health authorities place the blame for the present situation on the laxity of the public in the matter of vaccination, and to the vigorous anti-vaccination propaganda of the past few years. It was formerly required of all objectors to compulsory vaccination that they obtain a special certificate of exemption. This ruling was abrogated some time since, but a demand is rising in some quarters for its restoration.

ANIMALS OF LONDON ZOO FEAST ON $50,000 FARE

Choice items on the bill of fare of the animals of the London Zoological Gardens during the past year included: 440 horses, weighing 220 tons, fed to the carnivores, 4 tons 15 cwt. codfish fed to the walrus, 35 tons of herrings and whiting, 1,590 pints of shrimps, 343 gallons of fresh milk, 14,000 tins of condensed milk, 128 pounds of honey, 258 pounds of ants' "eggs", 77 pounds of mealworms, 150 bunches of onions, 108 heads of celery, and 213,085 bananas. The food consumed in a year cost $50,000.

Two million dollars is spent annually in this country on rat poisons and traps.